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(54) Illumination Device

An illumination device including at least one, preferably, three light sources (15) and an electronic control device (10) to control the brightness of the light generated is proposed, wherein it is possible to adjust the luminous color continuously as desired. The invention allows any desired luminous color and brightness of the light to be adjusted and continuously modified such that variable applications for residential and recreational rooms, work areas, decorative displays, product displays, and recreational purposes are possible. For example, meditation programs and light shows may be implemented in any manner desired.

Description

The invention relates to an illumination device including at least one light source and an electronic control device to control the brightness of the light generated.

A known approach to adjusting the brightness of illumination in rooms involves so-called dimmers by which the brightness of the illumination lamps may be continuously adjusted. In addition, illumination devices are known for use in discos, theater stages, party rooms, or the like, in which rotatable disks having variously colored filter glasses are rotated in front of the corresponding lighting fixtures. Variation in the luminous colors is limited to the number of filter glasses used, generally four or six. In addition, it is not possible to modify the luminous color continuously since the action of rotation is only able to replace one filter glass of one color with a filter glass of another color.

One goal of the invention is to create an illumination device in which the brightness and luminous color may be adjusted practically at will and modified as desired for flexible applications.

This goal is achieved according to the invention by providing additional means for adjusting the luminous color continuously and as desired. Based on the wide variability of the generated light and generatable lighting effects of the illumination device according to the invention, it is possible to employ the invention not only in residential and recreational spaces, but also in well-appointed offices, for decorative product displays, product or art displays, and for recreational purposes. Special lighting effects may also be created by simultaneously modifying the brightness and luminous color. Standard adjustments may create any desired, freely selectable lighting conditions – with the possibilities for lighting design being practically unlimited and ranging from classical to futuristic. Lighting conditions may be optimally adjusted to the specific requirements, even taking into account physiological factors depending on what activity is momentarily being performed, such as office work, conversation, meditation, or the like.

Using the measures indicated in the subclaims, advantageous modifications and improvements of the illumination device presented in Claim 1 are possible.

A particularly advantageous system for continuously adjusting luminous color is created by providing at least two, preferably, three light sources of different colors, where a mixing device spectrally superimposed on the light of these light sources is attached to these sources. The light sources may appropriately be in the form of lamps of different colors, or associated filters of different colors – the three light sources specifically having spectrally complementary colors essentially producing white, specifically, Red, Green, and Blue. This makes it possible to require merely one control channel for the corresponding brightness for each light source in order to adjust the brightness and luminous color of the light at the output of the mixing device. This simple system enables any desired brightness and any desired luminous color to be adjusted – it being also

possible by varying one or more of the control channels to modify the luminous color continuously.

In order to generate additional lighting effects, a servo unit to mechanically change the position of at least one of the light sources is advantageously provided, which servo unit may be designed so as to move the lamps and/or to move or pivot lenses, mirrors, or optical gratings associated with the lamps. As a result, not only is it possible for the light to change continuously, but the light may also simultaneously assume different colors to create special effects. This allows for interesting light shows, applications in advertising, as well as theatrical effects.

In order to establish the standard settings for the illumination and to facilitate selection of specific lighting conditions, the control device has a digital memory device in which control commands are stored specifying permanently set brightnesses, luminous colors, and/or light source positions, these control commands being triggerable by electrical input signals. To enable dynamic lighting effects, the control device has a function generator which controls, in response to input signals, the brightnesses, luminous colors, light source positions, and/or functional sequences of these operations. Specifically, in the case of digital implementation of the function generator, this generator is able to act on the digital memory, or to call up addresses sequentially from this memory. In a simpler implementation, this function generator may, however, also act directly on the control channels or on the servo unit.

It is also possible to trigger the various functional sequences of the function generator in response to control commands from the digital memory, i.e. by using a button or keyboard, for example, to select an address of the memory, a specific functional sequence of the function generator is triggered by a corresponding control command.

Input buttons or input switches are provided to activate the control commands of the digital memory or the functions of the function generator. At the same time, standard functions such as warm-toned room lighting for reading illumination, white light for work activities, or specific functions of the function generator may be requested using permanently assigned keys of the input keyboard.

In order to generate additional lighting effects, at least one light-sensitive and/or sound-sensitive sensor is provided, the output signals of which are connected to the digital memory or function generator to trigger control commands of the digital memory and/or functions of the function generator. It is possible to connect a pattern recognition unit after this sensor or these sensors which uses the function generator or digital memory to convert the acoustic vibrations in the room, and/or the lighting conditions in the room into certain lighting or color patterns. The adaptation of the light by color and brightness according to corresponding characteristics of acoustic and optical room signals may be effected directly, or again through certain functions such as attenuation functions or time functions. For example, the illumination device may perform lighting variations with an attenuated effect and in a variable time-delayed fashion according to the envelope curve of the music. The acoustic adaptation function permits various meditation programs to be implemented in which the variation of the light is effected according to

meditative aspects as a function of music and light in the room. In the simplest case, it is possible to have the optical sensor merely automatically adjust the room brightness to, for example, the light of television picture tubes.

All the functions and settings of the illumination device may be advantageously activated by a wireless remote control, such as an IR remote control, for the electronic control device, the remote control being provided with input buttons or input switches. This approach allows for convenient adjustment and modification of the lighting conditions in response to the user's individual wishes.

One embodiment of the invention is illustrated in the drawing and explained in the following description. The single figure shows a block diagram of an embodiment of the illumination device.

The input of an electronic control device 10, which will be explained in greater detail below, is provided with an acoustic sensor 11 and an optical sensor 12. Three output channels of this electronic control device 10 corresponding to the color components Red (R), Green (G) and Blue (B) are connected through, for example, a brightness control device 13 in the form of a phase-angle control and a power stage 14, to a lamp unit 15 which has three light sources. These may be either three color incandescent lamps with the colors Red, Green, and Blue in the form of low-voltage halogen lamps or 220V lamps, or they may be monochromatic white lamps, the colors being generated by appropriate filters.

If the output power of the brightness control device is sufficient to power lamp unit 15, power stage 14 may, of course, be eliminated. In addition, three different colors capable of being combined by superimposition to form the color white may be substituted for the colors Red, Green, and Blue. In the simplest case, only two lamps may be provided, although this significantly limits variability. A greater number of lamps is, of course, also possible.

The output light in the three colors mentioned from lamp unit 15 is supplied to a light mixing device 16 where, given equal intensities, the light is combined to form white light. The approach here may employ the known arrangement of semitransparent and reflecting mirrors. The light emitted from this light mixing device 16 is supplied to an optical unit 17 where a desired angle of reflectance, focusing, or diffuse properties is/are adjusted. This function may also be performed by lenses, mirrors, or optical gratings. For example, an output lens on light mixing device 16 may replace optical unit 17.

A wireless remote control 18, emitting, for example, infrared or short-wave radiation, is provided with an input keyboard 19 in which the individual buttons or switches may be assigned to permanent functions or control commands. The radiation emitted may be received by a receiver device 20 and converted into electrical control signals. These actuate both electronic control device 10 and a servo

unit 21. This servo unit 21 serves to modify the positions of the lamps of lamp unit 15 relative to each other and/or to modify the positions and inclinations of the mirrors, lenses, or gratings in light mixing device 16, or in lamp unit 15. Another access not shown may be provided for optical unit 17.

The functional principle of the illumination device is the following: given a specified intensity for the three different-color light components, white light may be generated and emitted by optical unit 17 when these components are superimposed in light mixing device 16, and the light emitted by unit 17. This occurs, for example, when the intensities of the light components are equal. If the intensity of one light component is now changed, not only is a different light intensity produced at the output, but also a different luminous color. By varying the three light components Red, Green, and Blue, any desired brightness and luminous color may thus be generated, simply by modifying the individual light intensities with the brightness control device. If the relative positions of the lamps are modified by servo unit 21, or if the positions or angles of the mirrors, lenses or gratings in light mixing device 16 or in lamp unit 15 are modified, then there is no longer precise superimposition, and the light is again emitted with its original light components. This is indicated by broken lines at the output of light mixing device 16. This action allows additional lighting effects to be generated, even, for example, by moving only one lamp, so as to allow the superimposition of light to continue for the two other lamps.

Electronic control device 10 contains a digital memory 22, a preferably also digital function generator 23, and two pattern recognition units 24, the inputs of the two pattern recognition units 24 being connected to sensors 11 and 12. The outputs of these pattern recognition units 24 are connected both to digital memory 22 and function generator 23, which are in turn connected to each other. A plurality of intensity values is stored in digital memory 22, three intensity values being supplied simultaneously to brightness control device 13 by which to adjust the brightness of the three components simultaneously. Selection of the addresses of this memory results in the generation of three intensity control signals for brightness control device 13. At the same time, additional control signals for servo unit 21 may be stored at a number of addresses, these signals being fed to the servo unit through receiver device 20. In this way, an extremely large number of lighting states may be stored in this memory 22. For example, a variety of recurring lighting settings may be associated with permanently assigned keys of input keyboard 29, such as warm-tone room lighting for reading illumination, white light for work activities, or functions that will be explained in greater detail below.

Using function generator 23, predetermined lighting sequences and light shows may be set. The corresponding functions may be turned on either directly by remote control 18 at function generator 23, or corresponding addresses of digital memory 22 may be selected, and the functions of the function generator in turn triggered by the memory content of these addresses. The function generator itself may

itself act on brightness control device 13, or it sequentially accesses addresses of digital memory 22 by which control of brightness control device 13 is effected.

The signals of acoustic sensor 11 and optical sensor 12 are supplied to pattern recognition units 24, 25 which convert the signals either to accessing signals for addresses of the digital memory, or to signals for function generator 23, where they are again modified by degree or temporally before addresses are accessed. As a result, the color and brightness, for example, of the output light may cycle through variations of the music according to the envelope curve – with attenuated effect or variable time delays. This capability enables the implementation, for example, of different meditation programs, light shows, or the like. Of course, it is also possible to incorporate a control for servo unit 21. It is also possible to have corresponding variations and sequences dependent on the incidence of light in optical sensor 12. In the simplest case, the optical sensor merely implements an automatic adjustment to room brightness, for example to the light from television picture tubes.

In a simpler implementation, either the digital memory or the function generator may be eliminated. It is also possible in a simpler implementation to eliminate the remote control, input keyboard 19 here being located on electronic control device 10, or connected to this device through a cable.

It is, of course, also possible to combine the individual components, i.e., electronic control device 10, brightness control device 13, power stage 14, and receiver device 20, in one electronic device. This device may in turn may form a single structural unit including the remaining optical elements.

Claims

1. Illumination device including at least one light source and an electronic control device to control the brightness of the light generated, characterized in that additional means (13, 16) are provided for continuously adjusting the luminous color as desired.

2. Illumination device according to Claim 1, characterized in that at least two, preferably three, light sources (15) of different color are provided, a mixing device (16) spectrally superimposed on the light of these light sources being attached to these sources.

3. Illumination device according to Claim 2, characterized in that the light sources (15) are formed by lamps of different color or associated filters of different color.

4. Illumination device according to Claims 2 or 3, characterized in that the three light sources (15) have complementary colors combining to form essentially white light, specifically, Red, Green, and Blue.

5. Illumination device according to one of the Claims 2 through 4, characterized in that the electronic control device (10) has one control channel for the corresponding brightness for each light source in order to adjust the brightness and luminous color of the light emitted at the output of the mixing device (16).

6. Illumination device according to one of the foregoing claims, characterized in that a servo unit (21) is provided to mechanically modify the position of at least one of the light sources (15).

7. Illumination device according to Claim 6, characterized in that the servo unit (21) is designed to move the lamps, and/or move or pivot the lenses, mirrors or optical gratings associated with the lamps.

8. Illumination device according to one of the foregoing claims, characterized in that the control device (10) has a digital memory device (22) in which the control commands are stored specifying permanently set brightnesses, luminous colors, and/or light source positions, these control commands being triggerable by electrical input signals.

9. Illumination device according to one of the foregoing claims, characterized in that the control device (10) has a function generator (23) which controls brightness, luminous colors, light source positions, and/or functional sequences of the device in response to the input signals or operator signals.

10. Illumination device according to Claims 8 or 9, characterized in that the function generator (23) requests control commands from the digital memory (22).

11. Illumination device according to one of Claims 8 through 10, characterized in that different functional sequences of the function generator (23) may be triggered by control commands of the digital memory (22).

12. Illumination device according to one of Claims 8 through 11, characterized in that the function generator (23) is of a digital design.

13. Illumination device according to one of Claims 8 through 12, characterized in that input buttons or switches are provided to actuate control commands of the digital memory (22) or functions of the function generator (23).

14. Illumination device according to one of Claims 8 through 13, characterized in that at least one light-sensitive and/or sound-sensitive sensor (11, 12) is provided, the output signals of which are connected to the digital memory (22) or function generator to trigger control commands of the digital memory and/or functions of the function generator (23).

15. Illumination device according to Claim 14, characterized in that a pattern recognition device (24, 25) is attached after the sensor (11, 12).

16. Illumination device according to one of Claims 8 through 15, characterized in that a wireless remote control (18, 20) for the electronic control device is provided which is equipped with input buttons or switches (19).

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1 page of drawings attached
